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Carbon and Nitrogen Losses from Soil Depend on Degradation of Tibetan Kobresia Pastures

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Abstract

Copyright © 2016 John Wiley & Sons, Ltd. Degradation of Kobresia pygmaea pastures has strongly increased on the Tibetan Plateau over the last few decades and contributed to a high loss of soil organic carbon and nutrients. The pathways of carbon (C) and nitrogen (N) losses from degraded K. pygmaea pastures are still unclear, but this is a prerequisite to assess the recovery of Tibetan grasslands. We investigated the response of day- and nighttime CO 2 efflux and leaching of dissolved organic C and N, NH 4 + and NO 3 - from K. pygmaea root mats in three degradation stages: living root mat, dying root mat and dead root mat. Dying root mat had the highest C loss as CO 2 and as leached dissolved organic carbon. This indicates K. pygmaea pastures shift from a C sink to a C source following plant death. In contrast, living root mat had the lowest daytime CO 2 efflux (0·38 ± 0·1 μg C g −1 h −1) because CO 2 was assimilated via photosynthesis. Nighttime CO 2 efflux positively correlated with soil moisture for living and dead root mats. It indicates that increasing precipitation might accelerate C losses due to enhanced soil organic carbon decomposition. Furthermore, dead root mat had the highest average NO 3 − loss (23 ± 2·6 mg N L −1) from leaching compared with other root mats. Consequently, leaching increases the negative impacts of pasture degradation on N availability in these often N limited ecosystems and thus impedes the recovery of K. pastures following degradation. Copyright © 2016 John Wiley & Sons, Ltd.

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Keywords

CO efflux 2, dissolved organic carbon, grassland degradation, Kobresia pygmaea pasture, NO leaching 3 −

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